JPRS: 2414

9 April 1960

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- USSR -

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U. S. DEPARTMENT OF COMMERCE
WASHINGTON 25, D. C.

U. S. JOINT PUBLICATIONS RESEARCH SERVICE
205 EAST 42nd STREET, SUITE 300
NEW YORK 17, N. Y.

JPRS: 2414

CSO: 3481-N

Diseases of the Vegetative Nervous System in Leukemias

Excerpts From "AZERBAYDZHANSKIY MEDITSINSKIY ZHURNAL"

/The following are Translations of two articles appearing in AzMZh (Azerbaydzhan Medical Journal), No 12, Baku, 1959, pages 10-13 and 64-66; the respective authors are designated below./

From the Chair of Nervous Diseases (Head -- Active member of the Acad Med Sci USSR, Honored Worker of Science, Prof S. N. Davidenkov) of the Leningrad Order of Lenin Institute for the Advanced Training of Physicians imeni S. M. Kirov.

The problem of neural effects on the system of hemopoiesis can now be considered almost solved. The concept of the leading role of the nervous system in the regulation of hemopoiesis was expounded by S. P. Botkin as far back as 1883. In his clinical lectures devoted to the analysis of chlorosis, pernicious anemia, and cancer of the pylorus, he persistently expressed the concept of the neural regulation of hemopoiesis and hematodecomposition, and the possibility of reflex changes in both processes.

A direct key to the understanding of the processes of neural regulation of hemopoiesis was provided by the modern theory of cortico-visceral interrelations in the works of I. P. Pavlov, later expanded by K. M. Bykov and his associates.

In recent years the dynamics of neural regulation of hemopoiesis has been clarified by a great deal of material (V. N. Chernigovskiy, A. Ya. Yaroshevskiy). The role of the afferent and efferent innervation of organs in the regulation of the composition of blood has been ascertained. It has been determined that the organs of the blood system are connected with the central nervous system in two ways: first, the activity of organs of the blood system may be stimulated by means of the continuous effect on their receptors of all those changes which take place in the blood, in respect to its chemical composition; secondly, the activity of these organs may also be stimulated reflexionally from other receptor fields of the organism.

In the first instance, the reflex path is represented as follows: substances circulating in the blood reach the

organs of the blood system and, acting on their receptors, give origin to reflexes whereby the very organs of the blood system become working, functioning organs.

In the second instance, the reflex starts from receptor fields of other organs, and the inclusion of the organ of the blood system takes place as a result of the impulses coming to it from the central nervous system along centrifugal fibers.

These theses were confirmed in the experimental works of V. N. Chernigovskiy and A. Ya. Yaroshevskiy.

The situation regarding the study of the nervous system of leukemia patients is altogether different, for up to the present time no clear classification has been established in regard to the neurological symptoms encountered in various forms of leucoses.

There are works dealing with changes of the nervous system in leucoses; however, these works, in the majority of cases, have the character of casuistic reports. They are valuable in that they contribute to a considerable degree to the accumulation of descriptive data on individual neurological symptoms observed in leucoses. But we found no special studies of vegetative disturbances in leucoses. In this connection, we cite the observations which we made on 116 patients who suffered from various forms of leucoses (acute leukemia, chronic myelosis, and chronic lymphadenosis).

Various disturbances of the vegetative nervous system were elicited in approximately 80 percent of the patients. In some cases the vegetative disturbances were the first symptoms of the disease.

The tendency to perspire was one of the most frequent symptoms of the affliction of the vegetative nervous system. A particularly copious amount of perspiration was observed in our patients during sleep. Pain in the bones was the second most frequent symptom; dull pain in all bones and ribs was noted. Among frequent complaints were thirst and revulsion to sweets. Not infrequently, one could observe pupillary asymmetry, dilatation or contractions of the pupil, and Horner's syndrome. In isolated cases vegetative polyneurites were observed, accompanied by a distal sclerosis of the corneous layer of the skin, scaly desquamation of the skin, and bending and deformation of the nails. In one female patient we encountered Quinke edema, and in another -- diencephalic symptoms were the initial indications of her illness (acute leukemia).

As an objective method of investigation of the vegetative nervous system we employed the following studies; thermoregulatory apparatus of A. Ye. Shcherbak; thermoto-

topography, measuring of skin temperature by segments; sweat secretion and electro-cutaneous resistance by means of the N. N. Mishuk apparatus. The sugar curve was studied to determine carbohydrate metabolism.

The thermoregulating reflex was studied in 70 patients suffering from various forms of leucoses. We found that in 64 cases this reflex was pathologically altered, normal -- in six only. (see Table 1).

/Table 1_7

Forms of leucoses	Normal thermoregulatory Shcherbak reflex	reduced reflex	retarded reflex	negative reflex	distorted reflex
Acute leukemia	- -	3	1	--	--
Chronic myelosis	4	11	9	7	5
Chronic lymphadenosis	2	13	6	7	6

The reflex was considered reduced when the rectal temperature had risen no more than 0.2 degrees and had returned to the initial temperature within the next 30 minutes after a hand bath.

The reflex was considered retarded when the temperature did not return to the initial figure following its rise, i. e., where the second phase was absent.

When a rise in temperature was completely absent following a hand bath, the reflex was considered negative.

When the rectal temperature decreased following a hand bath, a distorted reflex was indicated. In the majority of our patients the thermoregulating process was either reduced or retarded, as may be observed from Table 1.

In order to study thermal topography, the temperature was taken at three points (in the rectum and the two axillary cavities) with three thermometers simultaneously. Measurements lasting three days were conducted at specific intervals.

The study of thermal topography was made on 26 patients. The results obtained are shown in Table 2.

It is known that rectal temperature normally must exceed the axillary temperature by not less than 0.5 degrees. One differentiates equal temperature level in the rectum and axilla (isothermy) and predominance of rectal temperature over axillary (thermoinversion). In evaluating our data we found that deviation from norm in the form of isothermy or thermoinversion was observed in more than one half of cases, (see Table 2).

/Table 2_7

Forms of leucoses	Normal thermo-topography	Thermo-inversion	Isothermy
Acute leukemia	2	1	1
Chronic myelosis	4	4	2
Chronic lymphadenosis	5	3	4

In addition, we studied thermometry by means of the N. N. Mishuk apparatus. Forehead, cheek, shoulder, forearm, hand (palm), abdomen, femur, calf and foot (sole) were studied symmetrically. Results of the thermometry are shown in Table 3.

/Table 3_7

Forms of leucoses	Normal temperature	General hyperthermy	Distal hyperthermy	General hypothermy	Distal hypothermy
Acute Leukemia	-	3	-	-	-
Chronic myelosis	2	12	1	4	3
Chronic lymphadenosis	4	8	-	3	-

Thus, in the majority of patients we observed hypothermy, less frequently -- hypothermy, still less frequently -- normal temperature.

For the study of sweat secretion, an electrometric method was employed. During normal sleep perspiration may be considerably reduced or even cease completely (Economo and Babskiy). However, increased perspiration is possible too. For instance, hyperhydrosis during sleep is encountered in parturient women and in tuberculous patients. Hyperhydrosis is observed during restless sleep -- accompanied by nightmares -- or during very light, superficial sleep. Obviously, higher activity of sweat glands during sleep is connected with the excitation of sections of the cerebral cortex, where the higher vegetative centers which send impulses to the sweat glands are located.

In the majority of our patients copious perspiration occurred during sleep. The sleep of these patients was very superficial. Upon awakening they often complained of nightmares. When questioning them we noted that they found their shirts and pillows moist with per-

spiration upon awakening.

Their perspiration was moderate during waking hours.

We also observed patients with complete anhydrosis. The skin of these patients was dry and peeling; hyperkeratosis was present in distal areas, most frequently in the soles.

In order to study their carbohydrate metabolism, we examined the sugar curve of 94 patients (see Table 4).

The sugar curves were divided into four groups according to their pattern. To the first group belong all normal curves. To the second -- "sluggish" or "flattened" curves, in which the rise of sugar content of the blood was small or showed a slow, gradual increase with a slow return to the initial figure, and where the hypoglycemic coefficient was low (below 1.35). The third group consisted of curves with a very high rise in sugar after loading, the so-called "irritative" sugar curves. To the fourth group belong the so-called "double-apex" sugar curves, which were characterized by a normal rise of sugar toward the 30th minute followed by a secondary rise which appeared on the descending curve at the 120th to 150th minute.

/Table 4_7

Forms of leucoses	Normal sugar curve	Flattened or retarded curve	Irritative sugar curve	"Double-apex" sugar curve
Acute leukemia	1	1	-	3
Chronic myelosis	24	8	6	23
Chronic lymphadenitis	13	3	7	5

As is seen from Table 4, a pathologically changed sugar curve was found in 56 out of 94 patients, i. e., in the majority of cases.

In summarizing we can state that the vegetative nervous system is very frequently affected in leucoses. The central and peripheral areas are involved.

The above studies of the vegetative nervous system (Shcherbak reflex, thermotopography, electrothermometry, and the measuring of the electrocutaneous resistance) showed various deviations of a pathologic nature in the majority of cases. These characteristics of vegetative disturbances in leukemic patients undoubtedly deserve close attention and further study.

The Effect of Ionizing Radiation On The Eye

/Docent G. G. Kanbay_7

We set ourselves the task of studying the effect on the eye of a single dose of ionizing radiation. The experiments were conducted on six rabbits.

Method: by means of a "Burevestnik" apparatus the rabbits were subjected to a local irradiation of the eyes with a 450 r dose under the following conditions: voltage 165 kW with condenser, strength of current 4 mA, filter Cu 0.5 mm+Al 1 mm, skin-focal distance 30 cm, diameter of localizer -- field 4x1 cm, strength of dose 22.5 r per 1 min, duration of irradiation 20 minutes.

The eyes were examined by lateral illumination, corneal microscope, ophthalmoscope, slot-lamp, and fluorescein. The sensitivity of the cornea was determined by means of filament-analgesimeters according to the A. Ya. Samoylov method, with our modification applicable to rabbits. The studies were made with three filaments: 0.3 r on 1 mm^2, 1.0 r on 1 mm^2, and 10.0 r on 1 mm^2.

First, the tactile sensitivity was determined with weak analgesimeters; then, with stronger ones (10 r on 1 mm^2), the sensation of pain was determined.

The results of our experiments showed that ionizing irradiation affects the sensitivity of the cornea according to a definite pattern. Of all the methods of examination which we employed, only the analgesimeters were primarily to establish the effect of ionizing irradiation. The data on the normal sensitivity of the cornea of each rabbit before irradiation served as the control. Previous to this study we examined corneal sensitivity on a large number of rabbits. We succeeded in establishing mean figures of sensitivity for the cornea of rabbits' eyes: for a filament 0.3 r to 1 mm^2 -- five; for a filament 1.0 r to 1 mm^2 -- eight; and for a filament 10.0 r to 1 mm^2 -- 13 (see table 1). The left eye was exposed to irradiation. Observation on the animals was carried out for one month.

Our experiments showed, first of all, that upon irradiation of only one eye with a 450-r dose -- and with screening of the rest of the animal's body, -- there were no fatalities during the month of observation.

Upon this irradiation dose, a certain immobility was observed in the animals during the first few minutes following irradiation. It passed away quickly and the rabbits showed no difference in their behavior from control animals.

Our data correspond to the data in literature, which indicate that a dose which has a fatal effect on the animals, upon general irradiation of the abdominal area and the pelvis, does not cause death when a similar dose is applied to the head or parts of the head.

Obviously, upon the action of Xrays and other types of ionizing radiation, not only is the dose important but also the part of the body which is exposed to irradiation.

/Table 1/

Sensitivity of the cornea in rabbits one week after irradiation.

Rabbits	Filaments on 1 mm^2	0.3 r	1.0 r	10.0 r
No. 1	before experiment	5	8	13
	7 days after experiment	5	8	13
No. 2	before experiment	4	7	13
	7 days after "	4	7	13
No. 3	before experiment	5	7	13
	7 days after "	5	7	13
No. 4	before experiment	4	7	13
	7 days after "	4	7	13
No. 5	before experiment	5	6	13
	7 days after "	5	6	13
No. 6	before experiment	4	6	13
	7 days after "	4	6	13

No change was observed in the eyes of the animals during the second and third week.

Toward the fourth week, changes of sensitivity in the cornea began to appear (see Table 2, on page 8).

As is seen from Table 2, rabbits No 1, 2, and 3 showed a decrease in tactile sensation after one month. Filaments 0.3 r on 1 mm^2 and 1.0 r / reads 10.0 r / on 1 mm^2 showed one flicker reflex less than norm. Rabbits No 4, 5, and 6 showed two flicker reflexes less than norm. The sensation of pain (10.0 r on 1 mm^2) in all rabbits showed no deviation during the month.

The corneal envelope, by reason of its location in the eye ball, represents the marginal tissue between the optical analyzer and the external medium. The cornea is rich in nervous fibers.

In studying the effect of ionizing radiation on the eye it is necessary to start with the determination of corneal sensitivity.

/Table 2 7

Sensitivity of the cornea in rabbits one month after irradiation

Rabbits	Filaments on 1 mm^2	0.3 r	1.0 r	10.0 r
No 1	before experiment	5	8	13
	one month after	4	7	13
No 2	before experiment	4	7	13
	one month after	3	6	13
No 3	before experiment	5	7	13
	one month after	4	6	13
No 4	before experiment	4	7	13
	one month after	2	6	13
No 5	before experiment	5	6	13
	one month after	3	4	13
No 6	before experiment	4	6	13
	one month after	2	4	13

We were unable to find other clinical changes in the eye of the experimental animals during the month of observation.

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